Mason (E.)

WITH THE COMPLIMENTS OF THE AUTHOR.

TWO SUCCESSFUL CASES

OF

AMPUTATION AT THE HIP-JOINT,

WITH

REMARKS UPON THE OPERATION.

BY

ERSKINE MASON, M. D.,

SURGEON TO BELLEVUE AND THE ROOSEVELT HOSPITALS.

[*REPRINTED FROM THE NEW YORK MEDICAL JOURNAL, DEC.*, 1876.]

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THE POPULAR SCIENCE MONTHLY.

CONDUCTED BY

E. L. YOUMANS.

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CHONDRO-SARCOMA.

(From a Photograph of the Femur in Case II., Dr. Erskine Mason's Amputation at the Hip-Joint.)

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TWO SUCCESSFUL CASES OF AMPUTATION AT THE HIP-JOINT, WITH REMARKS UPON THE OPERATION.

Case I.—Charles Taylor, aged eighteen, native of New York City, worker in a tobacco-manufactory, entered my service at the Roosevelt Hospital, April 17, 1876, with the following history: At three years of age he had a severe attack of scarlet fever, which left him with a paralysis of the right lower extremity. When he had so far recovered as to get about, he was in the habit, "when tired of traveling on his crutch," of walking on the ball of his right foot, and resting his right hand upon the right knee; in this way was produced an extreme case of talipes equino-valgus. At eight years of age he had a fall from a window, which severely injured the knee, and he was told that he had broken it. Since this injury he has walked entirely with a crutch, and for convenience he would wrap the limb around the crutch (throwing the thigh anterior and external, the leg posterior and internal to it). For the past five years he has been able to place the limb with his hands in various abnormal positions, six of

which positions are illustrated in the following diagrams, taken from photographs of the patient a few days before the operation. At times he would have pain in the hip-joint, and he stated that for some years he had made up his mind to have the limb removed, as it was always an incumbrance to him, and now it most seriously impeded him while at work. With this view he entered the hospital, being of an age, he said, to act for himself, and being prepared to take the consequences.

Examination upon admission shows the patient to be of the average height and in vigorous health, which he has enjoyed since his fall at eight years of age. Physically he presents a magnificent development, his muscles standing out (with exception of the right lower extremity) like those of a professional gymnast. Morally there seems to be no such thing as fear in his constitution. As he lies upon his back, the right thigh lies upon its outer surface, and at right angles to the pelvis. In this position the head of the femur can be felt to be near the ramus of the pubis. The leg is at right angles to the thigh, and cannot be extended, owing to a subluxation of the tibia outward. There is a paralysis of the extensor muscles of the leg and thigh, though some of the flexors and gluteal muscles are called into action. This limb is greatly atrophied, as shown by the following measurements:

Left thigh at gluteal fold	circumference	16¾ inches.
Right thigh at gluteal fold		12 "
Middle of left thigh	circumference	16 "
Middle of right thigh		9½ "
Circumference above left knee		12½ "
Circumference above right knee		8¾ "
Circumference below left knee		12¼ "
Circumference below right knee		8¾
Circumference above left ankle		7⅞ "
Circumference above right ankle		6 "

By circumduction of the thigh, the head of the femur can be made to change its position to a considerable extent. While at rest it seems to be just outside the ramus of the pubis, where it appears a new socket had been formed. No pain was elicited while examining the joint. The limb could be

placed in almost every conceivable position; and an idea of the great freedom of motion allowed it may be obtained from the accompanying cuts. Any amputation short of exarticulation at the hip-joint would have been of little or no use to him, as from the abnormal position of the head of the bone, and the want of muscular power, a serviceable artificial limb could not be had, and the remaining stump would also have been of great annoyance to him; and he did not entertain the idea of anything short of the entire removal of the limb. The gravity of the operation was explained to him, and the risk of life he ran, but he was firm in his determination and belief that he would recover. Upon consultation the operation was deemed justifiable, and one that offered flattering prospects of success.

April 20th, 2.30 P. M.—I performed amputation at the hip-joint, assisted by my colleagues, Drs. Markoe and Sands, and my friend Dr. George A. Peters. Esmarch's bandage was tightly applied to the limb as high up as the point of my incision (and allowed to remain on the limb during the operation), while an abdominal compressor was applied to the abdominal aorta, just above the umbilicus, by Dr. Peters, who most thoroughly supervised this part of the operation. The operation adopted was what is usually known as the circular method. The skin being divided with the large knife, it was drawn up by Dr. Markoe, and with a large scalpel I divided the various muscles to the ligaments, the soft parts being at the same time well retracted. As soon as the capsule was opened, Dr. Sands readily threw the bone from its socket. The anterior vessels were first ligated; the abdominal compressor was then removed, while the posterior vessels were controlled with pressure by sponges. The very small amount of blood lost was a surprise to all present. Thirteen vessels in all were ligated. It was estimated that not more than eight ounces of blood was lost during the whole operation, and half of this escaped from the limb through the femoral vein when this was severed. The fibrous capsule was then cut off close from the acetabulum, the inner half of the wound brought together with sutures, and the stump supported with straps. It was my intention to remove these sutures in a short time,

and treat the stump as an open one; but so speedily did union occur, that this idea was abandoned. The pulse at one time during the ligation of the vessels sank quite suddenly; a drachm and a half of brandy was at once given hypodermically, and two ounces per rectum, which quickly restored it. The head of the femur presented a spot of erosion, about the size of the little-finger nail, just below the insertion of the ligamentum teres, another upon the anterior surface of the head near the neck, while the posterior surface was flattened and slightly roughened, a fact which, under the circumstances, rendered the operation still more justifiable. The bone was found not to have been displaced from its normal socket, as previously supposed, but surrounded by a large and relaxed capsular ligament, which, with a long ligamentum teres, permitted the great freedom of motion. The right side of the pelvis was found atrophied and tilted downward, or retracted, presenting, indeed, that form of pelvis known in obstetrics as a high degree of the oblique oval pelvis. The acetabulum being very capacious, and approaching nearer the median line than usual, caused our error in diagnosis. It was this condition, with the elongated ligaments, which allowed us to throw the head of the bone very close if not quite into the perinæum.

The following is a brief detail of the progress of the case: At 6 P. M. of the day of the operation the patient had recovered from the ether and shock; pulse 100, temperature 98°. I saw him that night about nine; he had taken his tea, and said he felt very well. Ordered him one grain of opium, and he slept well during the night.

21*st*, 9 A. M.—Pulse 100, temperature 101°; says he "feels bully;" good appetite; 6 P. M., pulse 108, temperature 103°.

22*d*, 9 A. M.—Pulse 100, temperature 101°; 6 P. M., pulse 100, temperature 103°.

23*d*.—Union of inner two-thirds of the wound; 9 A. M., pulse 108, temperature 102°.

24*th*, 9 A. M.—Pulse 96, temperature 100½°. Discharge from the wound slight.

On the 26th both pulse and temperature were normal. The stump was syringed out night and morning with a solu-

tion of salicylic acid and water (1 to 300), and for two or three days, the discharge being somewhat offensive to the patient, the wound was dressed with bromo-chloralum. At no time was the discharge very great, and some days the stump was washed out every four hours.

29*th*.—Had slight diarrhœa, which was speedily checked.

May 3*d*.—Three ligatures came away.

7*th*.—Three more ligatures came off, and by the 13th all the ligatures were away, and the wound had nearly filled up.

On the 15th a spica bandage was applied, and the patient, who for some days had been sitting up, was told he might leave his bed.

17*th*.—He sat up nearly all day. The cavity has contracted to the size of a pen-holder; dressed with balsam Peru and strapped.

24*th*.—But a small portion of the wound not healed.

June 16*th*.—A small sinus was discovered running in the direction of the acetabulum. This day he ran a race around the hospital-grounds with a patient who had suffered amputation of the leg, and beat him. Patient remained in the hospital working about the ward some days after the stump had entirely healed. The sinus spoken of above had entirely closed, and he left the institution in sound health and with a beautiful stump, July 18th. The appearance of the stump is shown in the cut from a photograph which was taken the last week of September.

Case II.—Sarah Smith, aged thirty-five; England; widow; dress-maker; admitted to Roosevelt Hospital March 17, 1876.

Patient is a delicate-looking woman. Five years ago she first noticed pain extending along outer aspect of the left thigh from hip to knee; the pain became severe, and she was subjected to a variety of treatment, and at length received decided benefit. Five months ago she observed a small tumor situated on front part of the left thigh, just below the groin; at first it was soft and elastic, but gave her no pain; the growth however, was rapid, and became hard and very painful, the pain being lancinating in character, extending to the hip and down the thigh.

On admission there was found a tumor situated on the

antero-lateral aspect of left thigh, two and a quarter inches below the antero superior spinous process of the ileum, and extending from the median line backward to the great trochanter: its vertical diameter being three and a half inches; its transverse diameter, five and a quarter inches; circumference of left thigh over the tumor, twenty and a quarter inches; that of right thigh, eighteen and a half inches. The sartorius muscle and femoral artery skirt the inner margin of the tumor.

The tumor was hard and immovable, and apparently connected with the bone; its margins not well defined; skin not adherent. There was no enlargement of inguinal or lumbar glands, and no growth detected in the pelvis. Rotation of the thigh caused considerable pain, and she was no longer able to stoop over far enough to tie her shoe, on account of the pain the attempt produced.

Upon consultation, it was deemed advisable to attempt the removal of the tumor, and I did the operation March 28th, assisted by my colleagues, Drs. Markoe and Weir. A straight incision was made, commencing three-quarters of an inch to the outer side of, and two inches below, the antero-superior spinous process of the ileum, and extending downward for the distance of five inches. From the middle of this incision another was made outward to the extent of three and a quarter inches. The tissues were then carefully divided till the surface of the tumor was reached, which presented a white, glistening appearance. The tumor was now seen to be situated directly below the capsule of the joint, and was evidently firmly attached to the bone. Around the margin of the growth there were several spiculæ of bony growth. After the tumor had been disconnected from the soft parts, an attempt was made to detach it from the bone, but on so doing the sac ruptured, discharging a bluish-white material of the consistency of, and resembling very much, boiled starch; what remained of the tumor was then removed, and the bone which formed the posterior wall of this growth, together with the surrounding spiculæ, was cut away with the chisel; indeed, the whole surface of the exposed bone was thoroughly scraped. Just as we were about to close the wound, it was noticed that in a depression of the bone there was exuding some of the same kind of starch-like

material as was contained within the growth that had been removed. In the attempt to scoop out this material, the necessary turning of the instrument caused it to drop into the medullary cavity, so soft was the bone-tissue at this point. From this opening there exuded a soft, pulsating mass. It was the opinion at this time that amputation at the hip-joint was indicated, but, the consent of the patient not having been previously obtained, the wound was closed.[1]

March 29th.—Passed a restless night; suffers but little pain; dressings removed, discharge very free.

30*th.*—A few sutures removed from most dependent portion of wound to allow drainage. Mosquito-netting bandage applied.

31*st.*—Two sutures removed from upper portion of wound. Union has taken place at lower part of first incision. Temperature normal.

April 3d.—Discharge is abundant; there is slight bagging at upper extremity of wound.

6*th.*—Bagging at lower and outer part of thigh; counter-opening made; irrigated, and tent of oakum passed through.

8*th.*—Suffers good deal of pain in limb; does not sleep well at night; is greatly annoyed by profuse night-sweats; ordered tr. ferri chlorid. m. iv, and quin. sulph. gr. iij, three times daily, and sp. vin. Gall. ℥ iv daily.

10*th.*—Discharge profuse and offensive, resembling fecal matter.

12*th.*—Somewhat improved; upper part of thigh doing well.

18*th.*—Wound very much improved; appetite still poor; discharge small.

23*d.*—Continues to improve; wound closing up, except

[1] Dr. Delafield, the pathologist of the hospital, reported, upon examination of the growth, that the sac was composed of merely connective tissue and spiculæ of bone. The gelatinous substance adhering to the inner wall of the sac was composed of basement membrane, partly fibrillated, partly granular, and partly hyaline, in which were imbedded round fusiform and stellate cells, which resembled those of hyaline cartilage. It seemed to be a tumor composed of cartilage-tissue, with an excess of cells, a considerable admixture of ordinary connective-tissue cells, and belonging to the class of tumors known as *chondro-sarcoma*.

three small openings along the first incision. Is sitting up for a few hours every day.

29*th*.—Ulcer on most dependent incision nearly healed.

May 1*st*.—Ulcer on dependent incision again communicates with a sinus; general condition is good; appetite improved; continues to suffer pain in the limb; still has night-sweats.

June 9*th*.—Upper portion of femur is evidently getting larger; suffers continually with pain; general condition is about as good as at any time since the operation. The proposal of amputation at hip-joint has been made to patient. The growth is supposed to be within the medullary cavity, with a small amount of periosteal growth.

11*th*.—Has concluded to have the limb removed.

14*th*.—Discharge free and offensive; night-sweats continue.

15*th*.—Is feeling badly this morning; suffered from nausea and vomiting during the night; takes very little nourishment.

16*th*.—Slept better last night.

17*th*.—Circumference of right thigh, sixteen and a half inches; circumference of *left* thigh, eighteen and a half inches. 2.30 P. M.—Patient under ether; Esmarch's bandage applied, together with abdominal compressor to aorta. I performed amputation at hip-joint, assisted by Drs. Markoe, Sands, Weir, and Peters. A circular incision was made with amputating-knife through integument, the skin retracted, and the tissues divided down to the bone, then dissecting them up along the femur to the joint; after disarticulation, the femoral artery was ligated, after which the abdominal compressor was removed, and other bleeding points secured, fifteen ligatures being used in all; hæmorrhage amounted to only *two ounces*; flaps brought together and held by five sutures, and drainage-tube inserted; patient showed but slight amount of shock during operation, her pulse being good throughout. 6 P. M.—Patient recovered from ether, and removed to her ward; there appears to be very little pain and no shock; given opii gr. j, and repeated in three hours; pulse 120, temperature 98½°. 12 P. M.—Patient is vomiting; five minims of Magendie's solution of morphia given hypodermically, and a mustard-plaster to abdomen, gave relief.

18*th*.—Suffers from effects of ether; pulse and temperature normal.

19*th*.—Patient slept well and is now quiet; no pain; wound washed out with salicylic acid, 1 to 500. 2 P. M.—Complains of pain across the abdomen and is restless; given Magendie's sol. morphia m. viij hypodermically every three hours, and turpentine-stupe applied to abdomen. 6 P. M.—Is relieved of pain and much more comfortable.

20*th*.—Still has pain in abdomen, but it is controlled by opium; takes but little nourishment; discharge from wound free and offensive; sutures all removed and stump treated as an open wound. 6 P. M.—Pain in abdomen has returned; patient is much prostrated and is vomiting matter of a greenish color; given sp. vin. Gall. ℥ss every hour. 12 P. M.—Suffers very much pain; abdomen tympanitic; pulse 135, thready and compressible; given Magendie's solution m. x hypodermically.

21*st*.—Looking wretched; face anxious; troubled almost constantly with vomiting; belly very tympanitic and painful; peritonitis well marked. 12 M.—Patient looking better. 6 P. M.—Is quite cheerful; stump looks better.

22*d*.—Patient in about the same condition as yesterday; stump continues to improve; ordered ol. olivæ ℥vj, acid. carbol. ℥j, to be applied over the stump.

23*d*.—Patient is again down; looks as if she could not last twenty-four hours; vomiting constantly, and extremely restless; nourished per rectum: given acid. hydrocyan. dil. m. j, and bismuth subnit. gr. v, every two hours.

24*th*.—Patient somewhat better; not so much pain or vomiting.

25*th*.—Passed a very bad night, vomiting constantly and exceedingly restless. 12 M.—Is again more comfortable; stump improving.

26*th*.—Had a very good night; very little retching or vomiting; looks much better; belly not so tense, and has very little pain.

27*th*.—Had a small injection of soap-and-water, but it did not operate; patient improving, and says she is quite comfortable.

28*th.*—Had a small movement from the bowels at 9 A. M.; is very much improved; opium diminished gradually; had a second passage from the bowels this afternoon, quite natural in appearance; has had no hypodermics to-day.

29*th.*—Patient steadily improving; looks better and feels better; ate a small piece of beefsteak to-day.

30*th.*—Had a natural movement of the bowels to-day without the help of an enema.

July 1*st.*—Still improving; appetite good; stump looks beautiful; ordered to be strapped.

2*d.*—Patient feels better than at any time since operation; occasionally has pain in the bowels, which is relieved by one drachm U. S. sol. morphia. 9 P. M.—Complains of severe tenesmus, and is given an enema of oil and warm water.

3*d.*—Had two movements of bowels after enema; stump looks well. 6 P. M.—Had a number of loose passages during the day, and looks bad; ordered opii gr. j every three hours.

4*th.*—Diarrhœa checked; patient again better.

6*th.*—Thirteen of the ligatures came away, that of the femoral among them.

7*th.*—Patient not quite so well to-day, but stump contracting; last ligature came away.

10*th.*—Patient doing well; there is slight bagging in upper part of stump; a sinus is found leading up toward the dorsum ilii; drainage-tube inserted, and compression made with pad of oakum.

12*th.*—Discharge from sinus decreasing; wound strapped.

13*th.*—Wound contracting very much.

16*th.*—Patient sat up for an hour this afternoon.

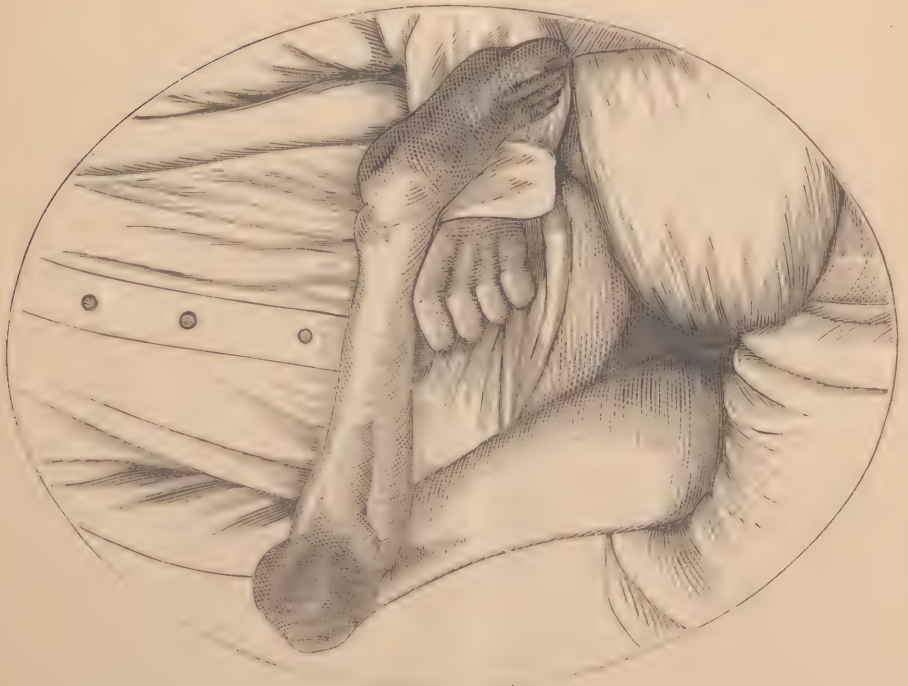
30*th.*—Steadily improving; wound contracting; sits up every day for an hour or more in the afternoon.

August 16*th.*—Stump doing wonderfully well, but a slight cavity left; general condition good.

September 1*st.*—Patient almost well; goes out on pass, and walks about without much difficulty; is getting fat.

14*th.*—Patient about cured.

The following diagrams represent the appearance of the femur and of the patient. The photograph was taken the first week in October.



The following is a description of the growth furnished by Dr. Delafield, pathologist to the hospital :

"*Sarcoma and Chondroma of the Femur* (*Mixed Tumor*). —There is a tumor beneath the periosteum about four inches long, surrounding the upper portion of the femur, and thickest on its outer aspect. The upper portion of the shaft of the femur, beginning at a point one inch below the great trochanter, and extending downward five inches, is expanded to a diameter of three inches. Within this expanded portion of the femur is a cavity filled with gelatinous material. The walls of this cavity are formed by the walls of the shaft of the bone.

"The medullary and cancellous portions of the femur surrounding this cavity are infiltrated with new growth. At some points the shaft of the bone is nearly destroyed, at others it is quite thick. The periosteal tumor is composed partly of connective tissue, partly of cartilage with fibrous basement-substance. The myelogenic growth is principally composed of connective tissue growing in the medullary cavities, with disappearance of the adjoining bone. This new connective tissue has a good deal of fibrillated basement-substance, and a moderate number of cells, mostly round.

"In some places, instead of this we find cartilage.

"The tumor is, therefore, of compósite structure, consisting partly of connective tissue and partly of cartilage."

Remarks.—It is with no little pleasure that I place upon record these two successful cases of amputation at the hip-joint ; cases not only of interest because recovering from such a grave operation, but each possessing features of especial interest in a pathological view, instructive in matters to be borne in mind in the performance of such operations, and setting forth the advantages, as well as some of the dangers to be avoided, in certain manipulations which were resorted to in these cases.

It seldom falls to the lot of civil or even military surgeons to be called upon to resort to this operation, so that our experience regarding it is perhaps more limited than that pertaining to any of the major operations in surgery. Each case, therefore, whether it be successful or unsuccessful, is deserv-

ing of being fully reported, and the advantages which each method of operating may appear to possess freely given. That the risks attending upon this operation are so grave, that surgeons have frequently abandoned patients to their fate rather than run the chance of giving them what has been considered the faintest chance for life, we all well know. These risks, however, we feel convinced from the study of cases that are reported, as well as from our experience of these two cases, may now, with the careful use of those aids which an enlightened science has placed at our command, be considerably diminished.

For the most thorough, full, and comprehensive *résumé* of all that pertains to this operation, either in connection with civil or military surgery, the profession is indebted to Dr. George A. Otis, assistant surgeon and brevet lieutenant-colonel United States Army, whose researches on this subject comprise Circular No. 7 of the Surgeon-General's office.

While referring to some points of this operation, we shall avail ourselves of the labors of Dr. Otis with some freedom, as the information contained in the circular referred to is necessarily possessed by but few.

In reference to the mortality of this operation, we find, according to this circular, that in the records of British civil surgery forty-seven operations are recorded, with sixteen recoveries. In four of these cases the thigh had previously been amputated in continuity. In the case of a child two years old, the operation was done on account of injuries; in the others for disease.

In American civil practice twenty-four operations are recorded, and fifteen successful cases reported, "so large a preponderance as to lead," says Dr. Otis, "to the suspicion that all the unfortunate cases have not been published. Of the one hundred and eleven amputations at the hip-joint in civil practice recorded in the circular, forty six succeeded and sixty-five terminated fatally, a mortality rate of 58.56. Since the publication of this work we have read the reports of several other cases, but are now unable to refer to them for the purpose of adding to these statistics. In military surgery we find the following results given: of one hundred and sixty-one cases,

one hundred and forty-two died, sixteen recovered, and three are classed as doubtful.

The results of this operation, as gathered from the war of the rebellion, are most interesting, and gratifying to the pride of American surgery. Previous to this war, we believe, there had been no successful case of recovery from a primary amputation.

During the rebellion, of primary operations there were nineteen cases, of which eleven died from immediate shock, five between the second and tenth day. One was in perfect health four years after the operation; one was alive and well two months afterward; and one six months after the operation.

Of intermediate operations there were eighteen cases, all of which were fatal.

Of secondary operations there were nine cases and two recoveries.

Of re-amputations for diseased thigh-stumps there were seven cases, with four recoveries.

The first successful case in military surgery was by Brownrigg, an English surgeon, on December 12, 1812. It was a secondary operation, done for complications resulting from gunshot-fracture of the femur received at Merida, Spain, on December 29, 1811.

The first case in this country in which the operation was done for a gunshot-wound was by Dr. Richard K. Hoffman, in the New York City Hospital, on May 12, 1849. The patient had received a fracture of the neck of the femur from a musket-ball during the Astor Place riot. He died the following day, from shock. To Dr. Gilmore belongs the honor, we believe, of being the first among American military surgeons to have a successful case of primary amputation. The operation was done near Seven Pines, June 4, 1862.

According to the American edition of Velpeau's "Operative Surgery," the first operation done in civil practice in this country by an American was performed in Bardstown, Kentucky, August, 1806, upon a lad seventeen years of age, by Dr. Brashear. The operation appears to have been done for complications arising from fracture of the femur, and was

successful. No other case followed till that of Dr. Mott's, in this city, in September, 1824.

With respect to the mortality following this operation in military practice (gunshot-wounds), the records brought forward by Dr. Otis in Circular No. 7 show that it has not been so great as generally considered. The conclusion arrived at by Dr. Otis, after a very careful study of all the cases that he found reported, was:

1. That a primary operation for traumatic causes is not uniformly fatal.

2. That there is much evidence to controvert the prevailing doctrine that disarticulation at the hip is an exception to the general rule requiring all amputations deemed indispensable to be performed immediately, the eighteen intermediate amputations performed during the rebellion having all resulted fatally.

3. It is proved that secondary amputations at the hip for necrosis of the whole of the femur, or for chronic osteomyelitis following gunshot injury, may be performed with as successful results as hip-joint amputations for other pathological causes.

4. That when, after amputations in the continuity of the thigh, the stump has become diseased, re-amputations at the hip may be done with comparative safety.

After a careful study of the cases, and facts connected with them, as brought forward in his valuable circular, we feel that these statements are not to be controverted.

On the other hand, if we confine ourselves to the study of cases that more properly come under our observation in civil practice, we notice that during late years the mortality after this, as after other major operations, has diminished. This result cannot, we think, be regarded as due to greater dexterity on the part of surgeons at the present day, but rather to the more careful selection of cases, and the appliances that have been more recently placed in our hands.

An element which must largely weigh favorably in the success of this, as of every grave operation, is the moral condition of the patient (and fortunately a patient can never fully comprehend the risks to life he must necessarily run). In my

two cases it will be observed that this condition was most excellent, both being confident that they would recover, though one was told beforehand by a *cheerful friend* that she would certainly die, as none had been known to recover. Yet, in spite of a severe traumatic peritonitis, she remained plucky throughout, and suffered little or nothing from the shock of the operation.

Another great element conducive to a favorable issue, in my judgment, is the presence of thoroughly skilled assistants, as well as the greatest care in the after-treatment of the case, and salubrious surroundings of the patient. All these my patients possessed in the highest degree, and I take pleasure in publicly stating that to those who so efficiently rendered me their assistance in these cases is largely due the credit for the favorable results which followed.

In this operation a great aim of the surgeon has always been to have the patient lose as little blood as possible, and the fact that blood has been so freely lost no doubt may have been a cause of death in some of the earlier cases. For this reason the tying the femoral just below Poupart's ligament, as a preliminary step, was in some instances resorted to. Now the fear of danger from this cause has been removed. With the assistance of the abdominal tourniquet, controlling the circulation through the abdominal aorta, and the use of Esmarch's elastic bandage, less blood need be lost than we see daily shed in some comparatively trivial operations.

As far as we have been able to ascertain, these are the first two cases of amputation at the hip-joint where Esmarch's bandage was applied, and it accomplished the end for which it was used to a most eminent degree.

The tourniquet which we used was the one known as May's modification of Signoroni's, and completely controlled the aorta. This same instrument had previously worked well in two similar cases at St. Luke's Hospital by Drs. Buck and Weir. In my cases, however, it was found to be not so easily adjusted, and the compressing pad I think may have been too large. Should I be called upon to use a similar contrivance again I would give preference to the instrument which bears the name of Mr. Lister.

The use of this compressor is not without its dangers, as

has been shown in some cases where it was used in the treatment of aneurism, and as we were only too forcibly reminded in our second case, from which, as a result, we had a very serious case of peritonitis, which threatened to rob us of our patient.

We are aware that the aorta has in several cases been compressed for hours (Murray's case, five hours) by a tourniquet, and we have used it ourselves in a case of aneurism, and without any serious symptoms being manifested; and while in our first case not a symptom, even of soreness, was present, our experience in the second case was such that we feel it a duty to sound an alarm, and one which we believe should not go unheeded.

The time that this instrument was in use, in our cases, we regret was not accurately noted, but compression was only kept up till the vessels in the anterior portion of the wound were tied. The time of the operation, in the first case, till the bone was disarticulated, I am told by three separate observers who timed me, was twenty-nine seconds, so the period of compression of the aorta may thus be proximately arrived at.

With the second case the compressor was around the body longer; here considerable difficulty was experienced in arranging the instrument, and, while drawing the patient down a little farther to the edge of the table, the instrument slipped, which again required its adjustment; and when I had nearly made my incision through the integument, the femoral was observed to pulsate, and the compressor had to be altered again. In a note received from Dr. Peters, on this point, he says: "I did not mark, by the watch, the exact time during which compression was kept up upon the abdominal aorta in your two cases of amputation at the hip-joint. I should say, however, that the time did not in either case exceed ten minutes." In the first case I feel convinced that the time compression was made was shorter than in the second. Our experience on this point has convinced us that compression by the tourniquet, in this operation, should not be prolonged beyond the time necessary to secure the anterior vessels, the posterior ones being comparatively small, and readily controlled by pressure from sponges till severally secured.

Sufficient has been said with respect to the elastic bandage to prove it a most valuable adjunct in this operation. With

this bandage, and the tourniquet over the aorta, the loss of blood in this operation is reduced to a minimum. If we remember aright, Dr. Stephen Smith, in his collection of cases of hip-joint amputation, in the *New York Journal of Medicine*, for September, 1852, states that loss of blood at the time of operation has seldom been great, and consequently cannot be regarded as a cause of death in the cases reported. We never witnessed this operation in the hands of another but once, and on this occasion the loss of blood was truly frightful, the patient succumbing a few hours after he was placed in bed. In this case, at least, we have no doubt that the great loss of blood brought about speedy dissolution. Dr. Smith's paper also states that a reviewer in the *Dublin Quarterly* regards the great source of mortality attending this operation as due, not to loss of blood from the cut vessels, but the abstracting so much in the limb, being one-quarter or one-fifth of the entire blood in the body, while the viscera still continue to act as though none were removed. Should this be the great cause of mortality, Esmarch's bandage certainly does away with it.

As to the shock which the system necessarily sustains from the gravity of the operation itself, it has been sought to be lessened by a rapid execution of the operation. We cannot, however, regard this as a valid theory. With the bandage and the compressor there can be no call for great haste; and, with great rapidity in operating, we doubt if shock is lessened, or if in any way it is of much service to the patient.

We cannot help thinking that the great thing the patient has primarily to contend against is the loss of blood, and that it is this that is the great element in causing the shock, from which it is so often said, in this operation, the patients never rallied. All have noticed, in amputations at the upper portion of the thigh, that immediately after the operation the shock is often very great; the same is true in amputations at the shoulder-joint. This shock we have found may be very greatly diminished by giving subcutaneously an injection of a half to a drachm of brandy or whiskey immediately upon severing the limb from the body. This was used also in both my cases, and it was noticed with surprise, by many who were present, how slight was the shock the patients experienced.

After the vessels have been secured we believe it advisable

to remove all the capsular ligament which may remain around the acetabulum, as well as the ligamentum teres, and the fat that is usually found in the acetabulum. It will expedite healing of the wound and prevent the formation of sinuses, if not of necrosis of the acetabulum.

In respect to the various modes of operating, but little need be said, the surgeon too often having to do his operation according to circumstances. All, however, will be likely to fall under some variety of the flap or circular method. Probably the majority, were they able to select any operation, would give preference to the flap in this amputation. Such, indeed, had been my own predilection before I came to operate on the living subject, and that was the one I was accustomed to show to students, and had so frequently rehearsed upon the cadaver.

In my first case, either operation might readily have been selected, but at the solicitation of some of my friends I was induced to make use of what is usually known as the circular, or rather that of Alanson. So pleased was I with the ease with which it was performed, and the beauty of the resultant stump, that when I came to my second case, which perhaps did not, on account of the presence of the old wound and unhealthy tissue, readily admit of any other, I most cheerfully resorted to it.

The appearance of both these stumps, as shown in the plates, certainly speaks in its favor, and they contrast most favorably with any picture of such stumps that it has been my fortune to examine. The first case, certainly, is everything that a surgeon or a patient could desire.

Another great feature in its favor, it appears to me, is the ease with which it is dressed and irrigated without disturbing the patient to such a degree as would be necessary in the flap-operation. Again, the vessels, not being so obliquely cut, are perhaps the more readily taken up; and by this method, also, there probably remains a smaller suppurating surface; and, finally, if during the operation it be discovered that the bone may with impunity be severed just below or at the trochanters, it can readily be accomplished without any detriment to the patient; such would not be the case with the method by flaps. Hence this mode of operating, I think, strongly commends itself in cases of gunshot, railroad, or kindred injuries. While

thus speaking so favorably of this operation I do not wish to be understood as saying that it should be resorted to in every case, under all circumstances, for I believe a surgeon should never be exclusively wedded to one method of operating. My experience, however, has been such as strongly predisposes me in its favor.

Among those who not only advocated but resorted to this method, I find the names of Kerr, Abernethy, Cole, S. Cooper, Graefe, Krimer, Jaeger, Veitch, Larrey, Lacouchie, R. B. Bontecou, Blackman, and Compton.

In Circular No. 7, page 86, some interesting facts are mentioned in reference to the general condition of patients after this operation, in respect to the recovery of their strength, and tendency to the accumulation of fat. Four of the patients, who underwent this operation in the rebellion, have greatly increased in weight, one especially (Ulmer), who at the time of writing this circular was employed in a publishing-house in Philadelphia, weighed twenty-five pounds more than his average weight before he lost his limb. This rule, it states, is reversed in primary amputations for traumatic causes, after which patients commonly become emaciated rapidly, and long remain in a state of feebleness, from which they recover very gradually. In one of the cases mentioned, though four years have elapsed since his recovery from a primary amputation, he still writes that his health is delicate, and that he can do but little toward earning a maintenance.

In both my cases the restoration to health and strength has been rapid. Both have gained in weight, and especially in the woman is it very marked. She states that she never was so fat or felt so well in her life; and neither can be said to have led a very sedentary life since the operation.

In conclusion, after a somewhat careful study of this operation, we feel that in very many instances the great mortality formerly attendant upon it can be greatly diminished by employing all those resources which an enlightened science has placed at our command. A perusal of the cases recorded, I think, shows that the mortality has been steadily diminishing, and perhaps the day may not be far distant when the results of this operation may be made as favorable as those of amputation in the upper portion of the thigh.

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